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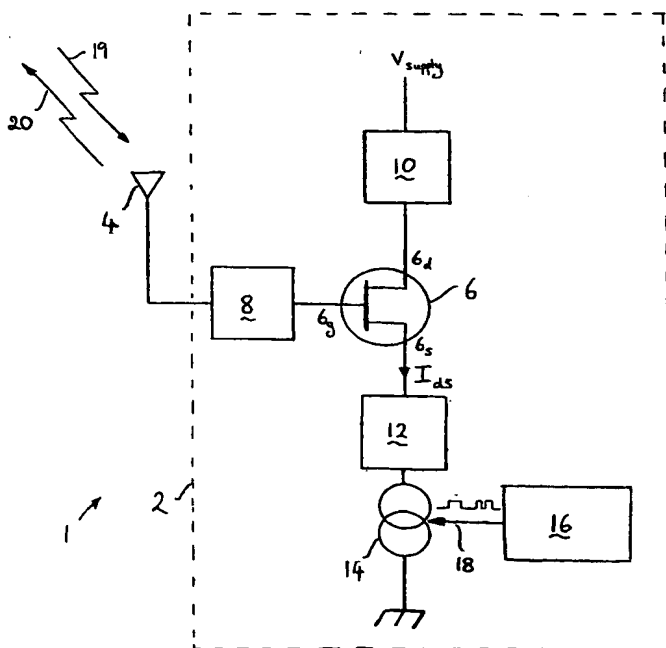
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9914941.1 25 June 1999 (25.06.1999) **GB**
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- Published:**  
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: REFLECTING MODULATOR CIRCUIT COMPRISING A NEGATIVE IMPEDANCE AMPLIFIER



(57) Abstract: A modulator circuit comprises a negative impedance amplifier (6) which is operable such that a signal applied to the amplifier (6) is reflected and amplified. Switching means (14, 16) are provided for switching the impedance of the amplifier (6) between two reflecting states such that the reflected and amplified signal is phase modulated. The impedances of the negative impedance amplifier are selected such that the phase of the reflected and amplified signal switches by substantially 180 degrees. Preferably the impedances of the negative impedance amplifier in the two reflecting states are selected such that the reflection gain of the amplifier in the two reflecting states is substantially the same such that the reflected and amplified signal is a binary phase shift keyed.

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## REFLECTING MODULATOR CIRCUIT COMPRISING A NEGATIVE IMPEDANCE AMPLIFIER

This invention relates to a modulator circuit and more especially to such a circuit for generating binary phase shift key modulation.

Modulation, which can be broadly defined as a time varying modification of a signal to impart information thereto, is a crucial feature of the design of almost all radio based systems. An effective and well known form of modulation for digital signals, is binary phase shift keying (BPSK). In BPSK one of the two digital states of information is imparted onto a carrier signal by modulating its phase to have two discrete values which are generally separated by 180 degrees ( $\pi$  radians). Whilst such a modulation technique may be efficient it has not previously been ideally suited for applications where low cost and low power consumption are paramount such as in tagging systems, since the known circuitry for generating BPSK is complex and consumes too much electrical power for operation from a finite battery supply.

The present invention has arisen in an endeavour to provide a modulator circuit which at least in part overcomes the limitations of the known modulators and which is suitable for use in a tagging systems or other applications where low power consumption and circuit simplicity are of importance.

According to the present invention a modulator circuit comprises: a negative impedance amplifier operable such that a signal applied to the amplifier is reflected and amplified and switching means for switching the impedance of the amplifier between two

reflecting states, characterised in that the impedances in the two reflecting states are selected such that the phase of the reflected and amplified signal switches by substantially 180 degrees.

- 5 Preferably the impedances in the two reflecting states are selected such that the reflection gain of the amplifier in the two reflecting states is substantially the same such that the reflected and amplified signal is a binary phase shift keyed.

Alternatively the impedances in the two reflecting states are selected such that the  
10 reflection gain of the amplifier in the two reflecting states is different and wherein said impedances are selected such the reflected and amplified signal is a substantially single sideband signal.

In a particularly preferred embodiment the negative impedance amplifier comprises a  
15 transistor, such as for example a bipolar or field effect transistor, and biasing means for biasing the transistor such as to act as a negative impedance amplifier. Such a modulator circuit is found to be particularly advantageous since it in essence can comprise only a single component. Furthermore, a negative impedance amplifier is capable of providing high gain at very low current, so its power consumption can  
20 accordingly be very low of the order of a few micro-amps. Conveniently when using a transistor the switching means switches the biasing of the transistor to switch the transistor between the two reflecting states.

Advantageously the modulator circuit further comprises an antenna for receiving

radiation and converting it to the signal applied to the amplifier and for radiating the reflected and amplified signal.

According to a second aspect of the invention there is provided a demodulator circuit  
5 for demodulating a Binary phase shift keyed signal which incorporates the modulator circuit described above.

According to a third aspect of the invention there is provided a transponder tag which incorporates the modulator circuit described above.

10

A modulator circuit in accordance with the invention will now be described by way of example only with reference to the accompanying drawings in which:

15

Figure 1 is a schematic representation of a transponder circuit which incorporates a modulator circuit in accordance with the invention;

Figure 2 is a schematic representation of a de-spreader circuit for use in a spread spectrum communication system which incorporates the modulator circuit of Figure 1; and

20

Figure 3 is a schematic representation of a spread spectrum communication system incorporating the modulator circuit of Figure 1.

Referring to Figure 1 there is shown a microwave frequency (2.45 GHz) pseudo passive

transponder tag 1 for use in a tagging system which incorporates a modulator circuit 2 in accordance with the invention. The tag 1 comprises an antenna 4 which is connected to the modulator circuit 2. The modulator circuit 2 comprises: a gallium arsenide (GaAs) field effect transistor (FET) 6, impedance matching/feedback networks 8,10,12  
5 connected to a respective transistor terminal, a switchable current source 14 and a control circuit 16. The antenna 4, which for operation at microwave frequencies conveniently comprises a patch antenna, is connected to the gate electrode  $6_g$  of the FET 6 via the matching network 8 which conveniently comprises a transmission line element. The drain electrode  $6_d$  of the FET 6 is connected to a positive supply  $V_{supply}$   
10 by the matching network 10. The source electrode  $6_s$  connected to ground via the matching network 12 and the switchable current source 14. The current source 14 is controlled by the control circuit 16 via a control line 18.

In a known manner the FET 6 is biased by a biasing network which comprises the  
15 matching/feedback networks 8, 10, 12 such that it operates in a linear relatively high gain region of its current/voltage characteristic. Conveniently each of the networks 8,10,12 comprises a transmission line element. The FET 6 thus amplifies and reflects any signal appearing at its gate electrode  $6_g$  and therefore acts as a negative impedance amplifier. This being said, it will be appreciated that in most applications the  
20 impedance of the amplifier is primarily resistive.

The magnitude of the negative impedance of the modular circuit 2 is dependent on the drain/source current  $I_{ds}$  passing through the transistor 6 and this current is determined by the switchable current source 14. The current source 14 is switchable between two

selected currents  $I_{ds1}$  and  $I_{ds2}$  in dependence upon control circuit 16. For both currents  $I_{ds1}$  and  $I_{ds2}$  the FET 6 operates as a negative impedance amplifier though for each current the magnitude of its negative impedance is different.

- 5 In operation of the circuit 1 the antenna 4 receives and converts microwave radiation 19 into an electrical signal which is applied via the matching network 8 to the gate  $6_g$  of the FET 6. As described above the FET 6 acts as a negative impedance amplifier and the electrical signal is reflected and amplified by the FET 6 and re-radiated as microwave radiation 20 from the antenna 4. In the case of tagging systems the
- 10 microwave radiation 19 is an interrogating radiation signal which can be a continuous wave or modulated wave signal. To impart information to the radiation 20 the control circuit 16 switches between the two currents  $I_{ds1}$  and  $I_{ds2}$  such that the phase of the radiation 20 switches by 180 degrees. An important feature of the invention is the selection of the magnitude of the negative impedance of the circuit 2 for the two
- 15 currents  $I_{ds1}$  and  $I_{ds2}$ . These are selected such that (i) the circuit has the same reflection gain for each current and (ii) the phase between the reflected and amplified signal for the two currents is switched by 180 degrees. The reflection gain (in decibels dB) of the circuit 1 as seen looking toward the gate terminal  $6_g$  is given by:

$$\text{gain} = 20 \log \left| \frac{Z_n - Z_o}{Z_n + Z_o} \right|$$

- where  $Z_o$  is the antenna impedance (or in the case where no antenna is present, it is the
- 20 system impedance) and  $Z_n$  is the input impedance presented by the FET 6 (that is the negative impedance looking towards the gate  $6_g$ ). For the embodiment shown in Figure

I the system/antenna impedance is nominally 50 ohms and the value of the negative impedance is switchable between -45 and -55.555 ohms for  $I_{ds1}$  and  $I_{ds2}$  respectively to give a reflection gain in each case of 25dB. It is to be noted that for these impedance values whilst the reflection gain is constant, the phase of the reflected and amplified signals will be altered by 180 degrees. This change of phase is indicated by the change of the sign of the term  $(Z_n - Z_o) \div (Z_n + Z_o)$ . Thus for the example of Figure 1  $I_{ds1}$  is selected such that the FET 6 operates as a negative impedance of -45 ohms and  $I_{ds2}$  is selected such that the FET 6 operates as negative impedance of -55.555 ohms. It will be appreciated therefore that the circuit 2 acts as a binary phase shift key reflective modulator. A particular advantage of the modulator circuit 2 is that it provides a simple method of generating BPSK and offers the additional benefit that it also amplifies the signal which it is modulating. Due to the circuit's simplicity it is ideally suited to tagging applications where it further has the advantage that it is capable of operating at very low currents (of the order of a few micro-amps) for an operating frequency of 2.4GHz.

With different values for the respective impedances, both the magnitude and phase of the reflected signal can be varied between the two states, such that a combination of amplitude modulation (AM) and phase modulation (PM) can be applied. With an appropriate combination of the two forms of modulation the radiated signal 20 can be arranged to be a substantially single sideband signal.

Referring to Figure 2 there is shown a schematic of a de-spreader circuit 21 for use in a spread spectrum communication system such as for example of the type used in a

global positioning system. As is known in such spread spectrum systems a carrier signal is modulated with a digital code, most often a pseudo random binary sequence (PRBS), to spread its energy spectra. Commonly the modulation used is BPSK. The circuit 21 is intended for de-spreading such spread spectrum radiation to recover the original carrier signal and any modulation applied thereto. This is achieved by using the modulator 2 of Figure 1 to apply a replica of the sequence used to generate the spread spectrum. It will be appreciated that the sequence applied by the circuit 21 is additionally in time synchronisation with the generating sequence.

10 The circuit 21 comprises; an antenna 22 for receiving broad band spread spectrum radiation 23, a broad pass-band filter 24, a narrow stop-band filter 25, a narrow pass-band filter 26 and a modulator circuit 2. The broad pass-band filter 24, narrow stop-band filter 25 and narrow pass-band filter 26 are connected in series and the output 28 of the narrow pass-band filter 26 provides the output 28 of the circuit 21. The antenna 22 is connected to the input 30 of the broad band filter 24. The modulator circuit 2, which is identical to the circuit shown in Figure 1, is connected to the interconnection 32 of the filters 25 and 26.

20 The reflective modulator circuit 2 has a gain of 20dB in both reflecting states. The reflecting state of the modulator 2 is controlled by a digital signal 34, which as described above is a replica of the original sequence signal used to generate the broad band signal 23. Most typically the signal 34 is a PRBS signal.

In operation the broad band spread radiation 23 is received and converted to an



electrical signal by the antenna 22 and passes through the broad pass-band filter 24 and narrow stop-band filter 25. The pass-band of the filter 24 defines the bandwidth of operation of the circuit 21. The centre frequency of the stop-band filter 25 is selected to correspond with the carrier frequency of the radiation 23 to block any components at the carrier frequency. The filtered signal appearing at the output 32a of the filter 25 is applied to both the input 32b of the narrow pass-band filter 26 and to the input 32c of the modulator 2. Due to the pass-band pass characteristic of the narrow band-pass filter 26 the filtered signal is blocked by the filter 26. The filtered signal however appearing at the input 32c of the modulator circuit 2 is de-modulated to produce an amplified version of the original carrier signal which is reflected back to the interconnection 32. The amplified carrier signal, which is within the band pass characteristic of the narrow pass-band filter 26, passes through substantially unattenuated to the output 28. The demodulated signal is prevented from returning to the antenna 22 by the stop-band filter 25. The circuit 20 thus operates as a de-spreader circuit and is capable of operating at substantially lower currents than those which currently use digital techniques.

A further example of an application of the reflector modulator in accordance with the invention is now described with reference to Figure 3 which is a schematic of a spread spectrum communication system 40 for use in covert communications between a transmitter 42 and a hand held radio receiver 44. As is known spreading the spectra of the transmitted signal, and hence spreading the energy over a large frequency range, makes it more difficult for the signal to be detected by unauthorised persons and hence for such persons to determine the position of the transmitting source.

Referring to Figure 3 the communication system 40 comprises: a spread spectrum transmitter 42 of a known type which generates a BPSK modulated broad band spread spectrum radiation 46, a reflective de-spreading circuit 48 and a hand held radio receiver 44. The de-spreader circuit 48 is identical to the transponder circuit 1 of Figure 1 in which the control circuit 16 switches the transistor 6 using an identical code to that used by the transmitter 42 to generate the spread signal 46. The de-spreader circuit 48 thus receives the broad band radiation 46 and in response radiates an amplified and de-spread narrow band radiation 50 which represents the recovered carrier of the signal 46 and any modulation applied thereto. The narrow band radiation 50 is detected by the hand held radio receiver 44. The de-spreading circuit 48 is preferably mounted at a high point such as on the side of a building 52 or other structure such as a post or a tree. Since the radiation 46 generated by the transmitter 42 is broad band this makes it difficult for a direction finding receiver to locate the position of the transmitter 42. Although such a direction finding receiver may be able to locate the narrow band radiated emissions 50 from the de-spreading circuit 48 and hence determine its position, it will still be unable to determine the position of the transmitter 42. In a preferred communication system a number of de-spreading circuits 48 (a second such circuit 48a is shown in Figure 3), each having a different modulation code, are located at different physical locations. The transmitter 42 is operable to switch between the different modulating codes during communication with the hand held radio 44 such that different de-spreading circuits 48 become activated. As a result the position from which the narrow band radiation 50, 50a originates will jump from de-spreading circuit 48 to de-spreading circuit 48a, thereby hampering any attempt to locate the position of the de-spreading circuit.

It will be appreciated that modifications can be made to the circuits described which are still within the scope of the invention. For example whilst in the examples described the modulator circuit uses a field effect transistor, which is much preferred for operation of microwave frequencies, the negative impedance amplifier can be  
5 implemented in different ways, depending upon the required frequency of operation, such as for example using a bi-polar transistor or other active devices. Furthermore the modulator circuit of the invention is not restricted to the applications described and is suited for use in any application which requires BPSK modulation. The present invention resides in the realisation that binary phase shift key modulation can be  
10 achieved by using a reflection amplifier and switching the circuit between two reflecting states which preferably have the same reflection gain (though this is not essential when single sideband operation is required), but which change the phase of the reflected signal by substantially 180 degrees.

CLAIMS

1. A modulator circuit (2) comprising: a negative impedance amplifier (6) operable such that a signal applied to the amplifier is reflected and amplified and switching means (14, 16) for switching the impedance of the amplifier (6) between two reflecting states, characterised in that the impedances in the two reflecting states are selected such that the phase of the reflected and amplified signal switches by substantially 180 degrees.
2. A modulator circuit according to Claim 1 in which the impedances in the two reflecting states are selected such that the reflection gain of the amplifier (6) in the two reflecting states is substantially the same such that the reflected and amplified signal is a binary phase shift keyed.
3. A modulator circuit according to Claim 1 in which the impedances in the two reflecting states are selected such that the reflection gain of the amplifier (6) in the two reflecting states is different and wherein said impedances are selected such the reflected and amplified signal is a substantially single sideband signal.
4. A modulator circuit according to Claim 1 or Claim 2 in which the negative impedance amplifier comprises a transistor (6) and biasing means (10, 12, 14) for biasing the transistor such as to act as negative impedance amplifier.

5. A modulator circuit according to Claim 4 in which the switching means (14, 16) switches the biasing of the transistor (6) to switch the transistor between the two reflecting states.
6. A modulator circuit according to any preceding claim and further comprising an antenna (4) for receiving radiation (19) and converting it to the signal applied to the amplifier (6) and for radiating (20) the reflected and amplified signal.
7. A modulator circuit according to any one of Claims 4, 5 or 6 in which the transistor (6) comprises a bipolar transistor.
8. A modulator circuit according to any one of Claims 4, 5 or 6 in which the transistor (6) comprises a field effect transistor.
9. A de-modulator circuit (21) for de-modulating a Binary Phase Shift Keyed signal incorporating a modulator circuit (2) according to any preceding claim.
10. A transponder tag incorporating a modulator circuit according to any preceding claim.

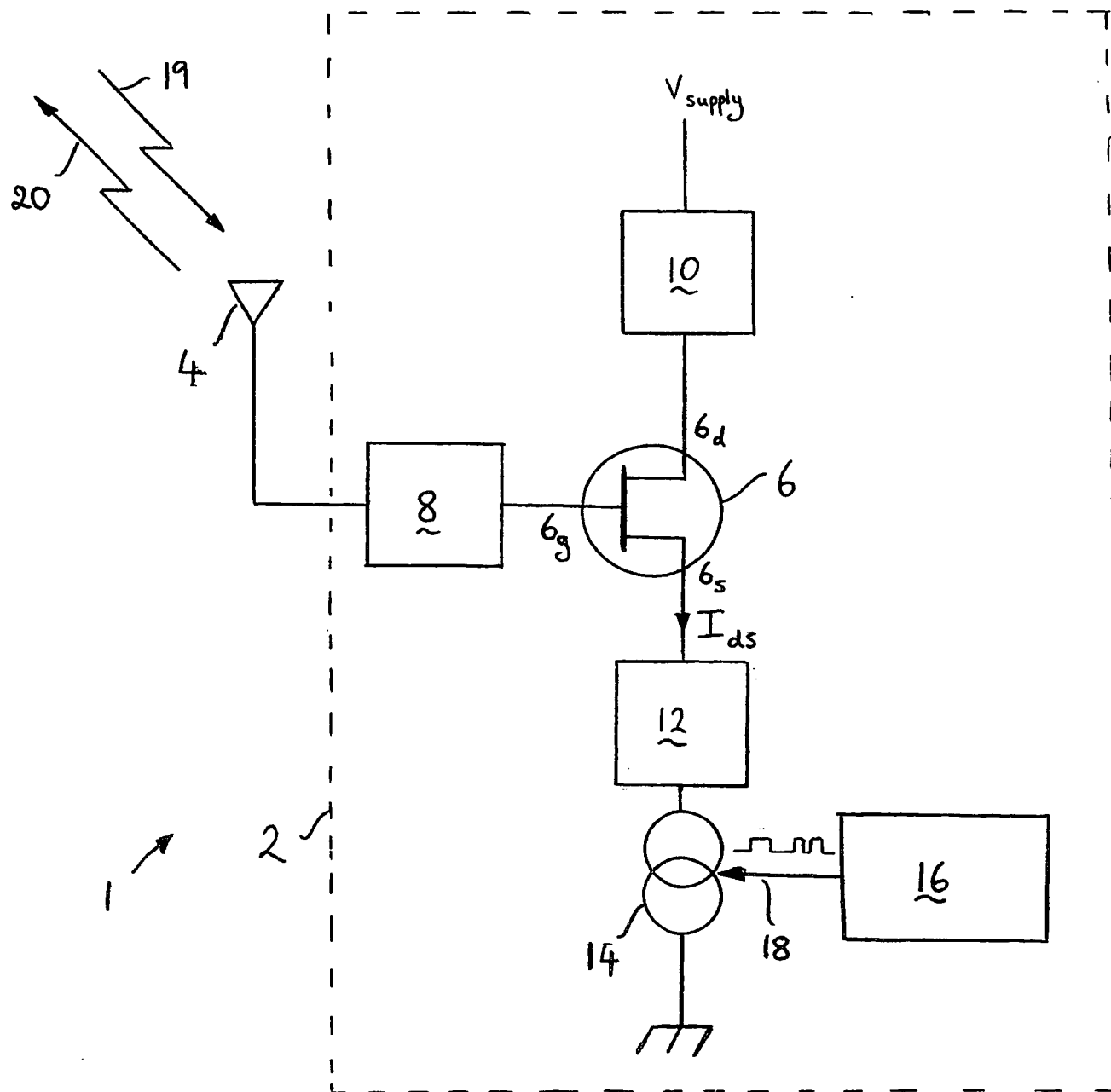


Figure 1.

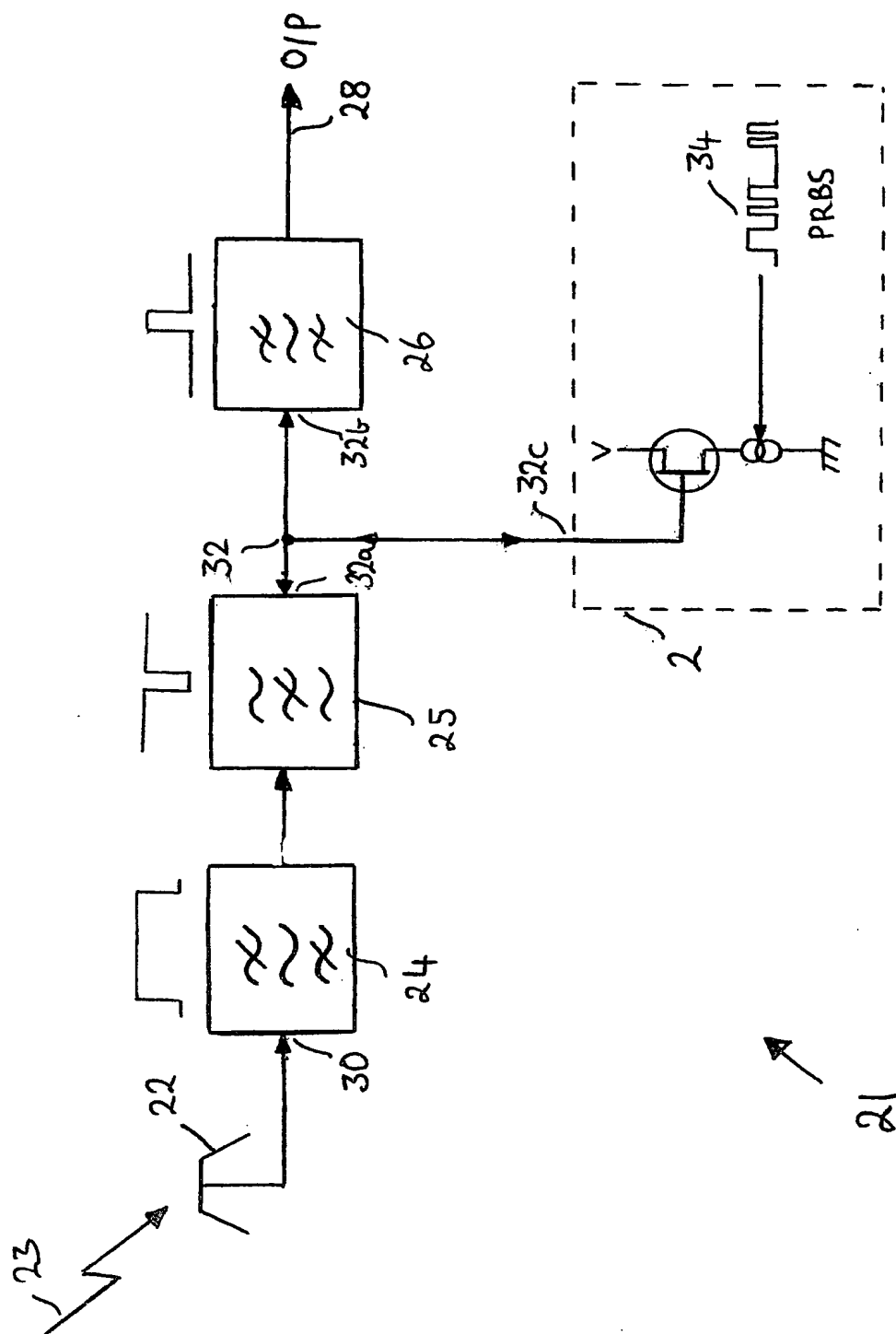


Figure 2.

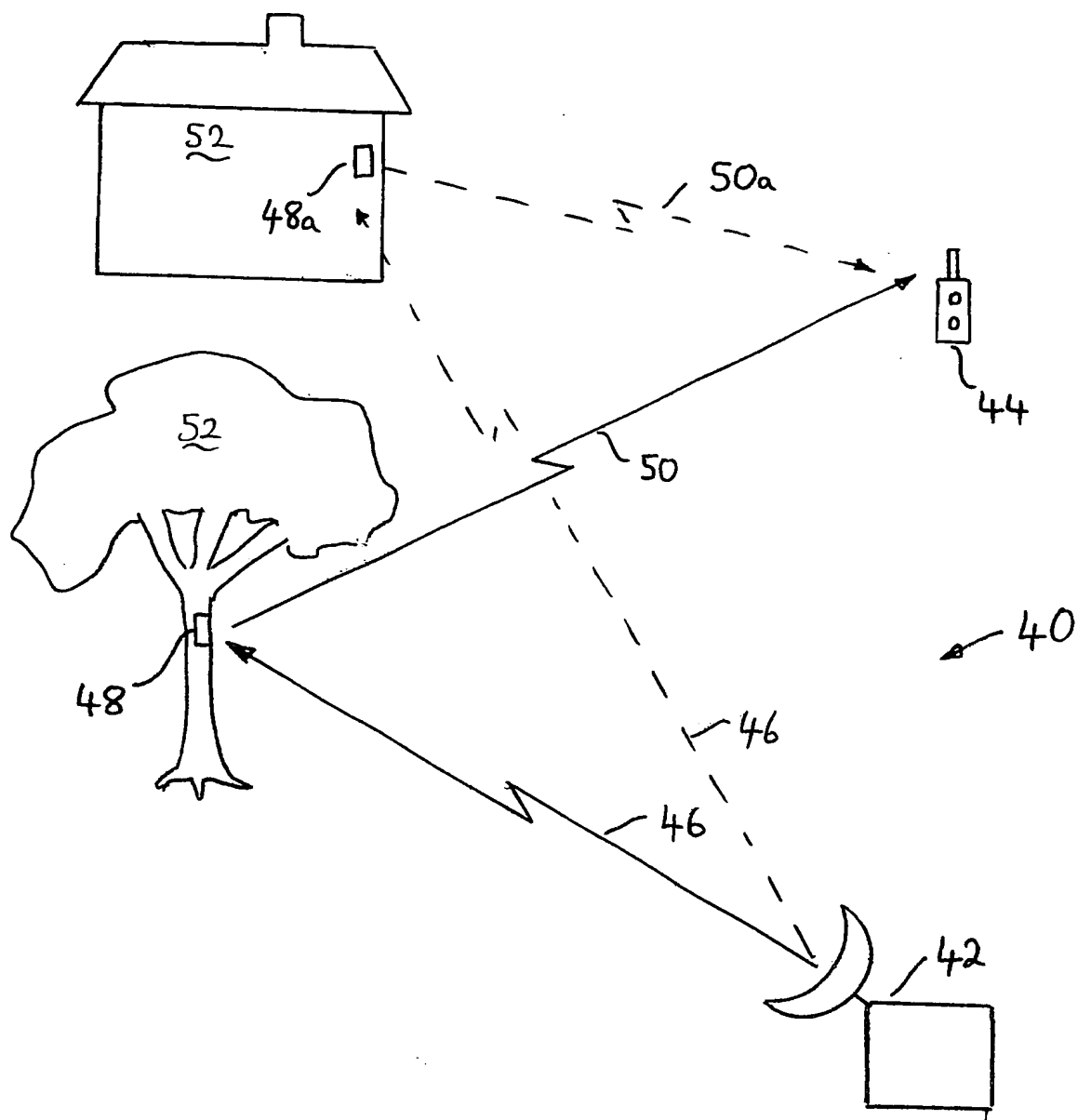


Figure 3



## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>P/61715/MRCE</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 00/ 02200</b>	International filing date (day/month/year) <b>07/06/2000</b>	(Earliest) Priority Date (day/month/year) <b>25/06/1999</b>
Applicant  <b>MARCONI CASWELL LIMITED</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

## 4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

**REFLECTING MODULATOR CIRCUIT COMPRISING A NEGATIVE IMPEDANCE AMPLIFIER**

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1  
☐ None of the figures.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02200

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04L27/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L G01S H03F H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	US 5 305 469 A (CAMIADE MARC ET AL) 19 April 1994 (1994-04-19)  abstract column 2, line 57 - line 65 column 4, line 25 - line 41 column 5, line 1 - line 12 column 5, line 54 - line 61 column 6, line 47 -column 7, line 31 figures 3,6  ---	1,3-6, 8-10 2
Y A	EP 0 324 564 A (SONY CORP) 19 July 1989 (1989-07-19)  abstract column 4, line 60 -column 5, line 16 figures 1,3  ---  -/--	1,3-6, 8-10 2



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

7 September 2000

Date of mailing of the international search report

19/09/2000

Name and mailing address of the ISA

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Authorized officer

Masche, C

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02200

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 288 035 A (SHARP KK) 26 October 1988 (1988-10-26)	3
A	abstract page 4, line 24 - line 27 page 5, line 11 - line 40 figures 1,2 ---	1,5,10
A	US 5 822 685 A (FORSTER IAN J) 13 October 1998 (1998-10-13) abstract column 2, line 39 - line 50 figure 1 ---	1,3-6,8, 10
A	DE 19 12 852 A (SIEMENS AG) 1 October 1970 (1970-10-01) page 3, line 20 -page 4, line 8 figure 3 -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02200

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5305469	A	19-04-1994	FR 2669475 A AT 120279 T CA 2055579 A DE 69108354 D DE 69108354 T EP 0486367 A JP 4268479 A	22-05-1992 15-04-1995 17-05-1992 27-04-1995 20-07-1995 20-05-1992 24-09-1992
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EP 0288035	A	26-10-1988	JP 1819999 C JP 5029161 B JP 63262906 A DE 3855408 D DE 3855408 T KR 9008158 B US 4890076 A	27-01-1994 28-04-1993 31-10-1988 14-08-1996 20-02-1997 03-11-1990 26-12-1989
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DE 1912852	A	01-10-1970	NONE	

## PCT COOPERATION TREATY

PCT

NOTIFICATION OF RECEIPT OF  
RECORD COPY

(PCT Rule 24.2(a))

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
Marconi Intellectual Property  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

RM	RU
24 JUL 2000	

Date of mailing (day/month/year) 12 July 2000 (12.07.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P/61715/MRCE	International application No. PCT/GB00/02200

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

MARCONI CASWELL LIMITED (for all designated States except US)  
FORSTER, Ian, James et al (for US)

International filing date : 07 June 2000 (07.06.00)  
Priority date(s) claimed : 25 June 1999 (25.06.99)  
Date of receipt of the record copy  
by the International Bureau : 29 June 2000 (29.06.00)  
List of designated Offices :

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW  
EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM  
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## ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase  
☐ confirmation of precautionary designations  
☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer: Ingrid Aulich
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 838.83.38

## INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. **It is the applicant's responsibility** to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

**For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.**

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

## CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

## REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
Marconi Intellectual Property  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

**NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT**

(PCT Administrative Instructions, Section 411)

Date of mailing (day/month/year) 23 October 2000 (23.10.00)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference P/61715/MRCE - <i>file WO/CP/ALS</i>	
International application No. PCT/GB00/02200	International filing date (day/month/year) 07 June 2000 (07.06.00)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 25 June 1999 (25.06.99)
Applicant MARCONI CASWELL LIMITED et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
25 June 1999 (25.06.99)	9914941.1	GB	10 Augu 2000 (10.08.00)

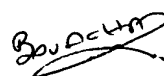
The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Magda BOUACHA

Telephone No. (41-22) 338.83.38



## PATENT COOPERATION TREATY

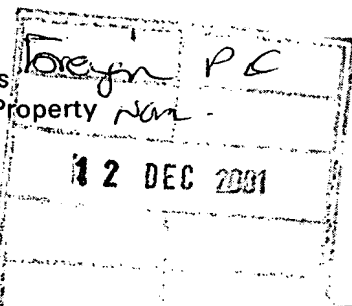
PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
Marconi Intellectual Property  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI



<b>Date of mailing</b> (day/month/year) 27 November 2001 (27.11.01)	<b>IMPORTANT NOTIFICATION</b>
<b>Applicant's or agent's file reference</b> P/61715/MRCE	
<b>International application No.</b> PCT/GB00/02200	<b>International filing date</b> (day/month/year) 07 June 2000 (07.06.00)

## 1. The following indications appeared on record concerning:

☒ the applicant      ☐ the inventor      ☐ the agent      ☐ the common representative

## Name and Address

MARCONI CASWELL LIMITED  
One Bruton Street  
London W1X 8AQ  
United Kingdom

State of Nationality  
GB

State of Residence  
GB

Telephone No.

Facsimile No.

Teleprinter No.

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person      ☐ the name      ☐ the address      ☐ the nationality      ☐ the residence

## Name and Address

MARCONI DATA SYSTEMS LTD.  
153 Dixons Hill Road  
Welham Green  
Hatfield  
Hertfordshire AL9 7JE  
United Kingdom

State of Nationality  
GB

State of Residence  
GB

Telephone No.

Facsimile No.

Teleprinter No.

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

☒ the receiving Office      ☐ the designated Offices concerned  
☐ the International Searching Authority      ☒ the elected Offices concerned  
☐ the International Preliminary Examining Authority      ☐ other:

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Ingrid AULICH

Telephone No.: (41-22) 338.83.38



## PATENT COOPERATION TREATY

10/019/40

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

To:

HOSTE, Colin, Francis  
Marconi Intellectual Property  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

<b>Date of mailing</b> (day/month/year) 27 November 2001 (27.11.01)	<b>IMPORTANT NOTIFICATION</b>
<b>Applicant's or agent's file reference</b> P/61715/MRCE	
<b>International application No.</b> PCT/GB00/02200	<b>International filing date</b> (day/month/year) 07 June 2000 (07.06.00)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input type="checkbox"/> the inventor	<input type="checkbox"/> the agent
<input type="checkbox"/> the common representative		
<b>Name and Address</b> MARCONI CASWELL LIMITED One Bruton Street London W1X 8AQ United Kingdom	<b>State of Nationality</b> GB	<b>State of Residence</b> GB
	<b>Telephone No.</b>	
	<b>Facsimile No.</b>	
	<b>Teleprinter No.</b>	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input checked="" type="checkbox"/> the person	<input type="checkbox"/> the name	<input type="checkbox"/> the address
<input type="checkbox"/> the nationality		
<input type="checkbox"/> the residence		
<b>Name and Address</b> MARCONI DATA SYSTEMS LTD. 153 Dixons Hill Road Welham Green Hatfield Hertfordshire AL9 7JE United Kingdom	<b>State of Nationality</b> GB	<b>State of Residence</b> GB
	<b>Telephone No.</b>	
	<b>Facsimile No.</b>	
	<b>Teleprinter No.</b>	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned	
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned	
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	<b>Authorized officer</b> Ingrid AULICH Telephone No.: (41-22) 338.83.38
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# PATENT COOPERATION TREATY

WO 01/01649  
PCT/GB00/02200

**PCT**

## NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
Marconi Intellectual Property  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

RECEIVED	2
CEH	
12 JAN 2001	
ITC	

Date of mailing (day/month/year) 04 January 2001 (04.01.01)		
Applicant's or agent's file reference P/61715/MRCE		
<b>IMPORTANT NOTICE</b>		
International application No. PCT/GB00/02200	International filing date (day/month/year) 07 June 2000 (07.06.00)	Priority date (day/month/year) 25 June 1999 (25.06.99)
Applicant MARCONI CASWELL LIMITED et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

AG,AU,DZ,KP,KR,MZ,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,  
GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,  
NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
04 January 2001 (04.01.01) under No. WO 01/01649

### REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

### REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 08 February 2001 (08.02.01)	
<b>International application No.</b> PCT/GB00/02200	<b>Applicant's or agent's file reference</b> P/61715/MRCE
<b>International filing date (day/month/year)</b> 07 June 2000 (07.06.00)	<b>Priority date (day/month/year)</b> 25 June 1999 (25.06.99)
<b>Applicant</b> FORSTER, Ian, James et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

16 January 2001 (16.01.01)

☐ in a notice effecting later election filed with the International Bureau on:
2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Juan Cruz  Telephone No.: (41-22) 338.83.38
---	---

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

TOLTREE Roger Keith  
Marconi Intellectual Property  
Waterhouse Lane  
Chelmsford  
Essex, CM1 2QX  
ROYAUME-UNI

**INFORMATION CONCERNING ELECTED  
OFFICES NOTIFIED OF THEIR ELECTION**

(PCT Rule 61.3)

Date of mailing (day/month/year) 08 February 2001 (08.02.01)		
Applicant's or agent's file reference P/61715/MRCE		<b>IMPORTANT INFORMATION</b>
International application No. PCT/GB00/02200	International filing date (day/month/year) 07 June 2000 (07.06.00)	
		Priority date (day/month/year) 25 June 1999 (25.06.99)
Applicant MARCONI CASWELL LIMITED et al		

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE

National : AU, BG, CA, CN, CZ, DE, IL, JP, KP, KR, MN, NO, NZ, PL, RO, RU, SE, SK, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

OA : BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

National : AE, AG, AL, AM, AT, AZ, BA, BB, BR, BY, CH, CR, CU, DK, DM, DZ, EE, ES, FI, GB, GD,  
GE, GH, GM, HR, HU, ID, IN, IS, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MW, MX,  
MZ, PT, SD, SG, SI, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW

3. The applicant is reminded that he must enter the "national phase" **before the expiration of 30 months from the priority date** before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until **31 months from the priority date** for all States designated for the purposes of obtaining a European patent.

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer:  Juan Cruz  Telephone No. (41-22) 338.83.38
---	---

# TENT COOPERATION TREATY

From the:  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

TOLFREE, Roger, Keith  
MARCONI INTELLECTUAL PROPERTY  
Waterhouse Lane  
Chelmsford, Essex CM1 2QX  
GRANDE BRETAGNE

<b>14 MAR 2001</b>	

**PCT**

**WRITTEN OPINION**

(PCT Rule 66)

Date of mailing  
(day/month/year)      12.03.2001

Applicant's or agent's file reference  
**P/61715/MRCE**

**REPLY DUE**      **within 3 month(s)**  
from the above date of mailing

International application No.  
**PCT/GB00/02200**

International filing date (day/month/year)  
**07/06/2000**

Priority date (day/month/year)  
**25/06/1999**

International Patent Classification (IPC) or both national classification and IPC  
**H04L27/20**

Applicant  
**MARCONI CASWELL LIMITED**

1. This written opinion is the **first** drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
  - I    ☒ Basis of the opinion
  - II   ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV   ☐ Lack of unity of invention
  - V    ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI   ☐ Certain document cited
  - VII ☒ Certain defects in the international application
  - VIII ☐ Certain observations on the international application
3. The applicant is hereby **invited to reply** to this opinion.
 

**When?**      See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

**How?**      By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

**Also:**      For an additional opportunity to submit amendments, see Rule 66.4.  
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.  
For an informal communication with the examiner, see Rule 66.6.

**If no reply is filed**, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **25/10/2001**.

Name and mailing address of the international preliminary examining authority:

European Patent Office - Gitschiner Str. 103  
D-10958 Berlin  
Tel. +49 30 25901 - 0  
Fax: +49 30 25901 - 840

Authorized officer / Examiner

**Masche, C**

Formalities officer (incl. extension of time limits)  
**Aldridge, S**  
Telephone No. +49 30 25901 735



**I. Basis of the opinion**

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".*):

**Description, pages:**

1-10 as originally filed

**Claims, No.:**

1-10 as originally filed

**Drawings, sheets:**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

## WRITTEN OPINION

International application No. PCT/GB00/02200

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

### V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims
Inventive step (IS)	Claims 1 3-6 8-10
Industrial applicability (IA)	Claims

2. Citations and explanations  
**see separate sheet**

### VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**Re Item V**

1. Reference is made to the following documents:

**D1: US 5 305 469 A (CAMIADE MARC ET AL) 19 April 1994 (1004-04-19)**

**D2: EP 0 324 564 A (SONY CORP) 19 July 1989 (1989-07-19)**

**D3: EP 0 288 035 A (SHARP KK) 26 October 1988 (1988-10-26)**

2. The present application does not meet the requirements of Article 33(1) PCT, because the subject matter of claims 1, 3-6 and 7-10 does not involve an inventive step in the sense of Article 33(3) PCT.

- 2.1 The document D1 is regarded as being the closest prior art to the subject matter of claim 1 (see D1; column 4, lines 25-40; column 5, lines 54-61; column 7, lines 20-31; figure 6), and discloses (the references in parentheses applying to this document):

A modulator (3) comprising: a negative impedance amplifier (11) operable such that a signal applied to the amplifier is reflected and amplified, switching means (28) for switching the impedance between two states, and a binary phase modulator (39) for switching the phase of the reflected and amplified signal.

- 2.2 The subject matter of claim 1 therefore differs from this disclosed in D1 in that the same amplifier is used to reflect and to phase modulate the signal.

- 2.3 The problem to be solved by the present application may therefore be regarded as how to reduce the number of components.

- 2.4 The presently claimed solution is considered to be obvious, because document D2 discloses a single field effect transistor, the impedance of which is switched between two different reflecting states, such that the phase of a reflected signal switches between two values (see D2; column 4, line 60 - column 5, line 16; figure 1). A skilled person having knowledge of the teachings of D1 and faced with



the same technical problem would not overlook the solution disclosed in D2, lying in the same technical field and dealing with the same general technical problem. In doing so, he would arrive at the subject matter of claim 1, which is consequently not inventive.

2.5 By the same reasoning, the additional features of dependent claims 4-6 and 8-10 cannot be considered as inventive, because these features are also disclosed in D1. The same holds for dependent claim 3, the additional features of which are disclosed in D3.

3. The combination of the features of dependent claim 2 is neither known from, nor rendered obvious by, the available prior art. It is suggested therefore that a new independent claim is drafted to include these features, bearing in mind that the features known in combination in D1 and D2 should be placed in the preamble of such a claim in accordance with Rule 6.3(b) PCT.

**Re Item VII**

Certain defects in the international application

To meet the requirements of Rule 5.1(a)(ii) PCT, documents D1, D2 and D3 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

PCT

REC'D 10 SEP 2001

WIPO

PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P/61715/MRCE	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB00/02200	International filing date (day/month/year) 07/06/2000	Priority date (day/month/year) 25/06/1999
International Patent Classification (IPC) or national classification and IPC H04L27/20		
Applicant MARCONI CASWELL LIMITED		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  16/01/2001	Date of completion of this report  31.08.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office - Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840	Authorized officer  Masche, C  Telephone No. +49 30 25901 471 

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB00/02200

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-10 as originally filed

**Claims, No.:**

1-10 as originally filed

**Drawings, sheets:**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02200

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes: Claims 1-10
	No: Claims
Inventive step (IS)	Yes: Claims 1-10
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-10
	No: Claims

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB00/02200

**Re Item V**

1. Reference is made to the following documents:

**D1: US 5 305 469 A (CAMIADE MARC ET AL) 19 April 1994 (1004-04-19)**

**D2: EP 0 324 564 A (SONY CORP) 19 July 1989 (1989-07-19)**

**D3: EP 0 288 035 A (SHARP KK) 26 October 1988 (1988-10-26)**

2. The document D1 is regarded as being the closest prior art as it discloses in combination the following features of present claim 1 (see D1; column 4, lines 25-40; column 5, lines 54-61; column 7, lines 20-31; figure 6; the references in parentheses applying to this document):

A modulator (3) comprising: a negative impedance amplifier (11) operable such that a signal applied to the amplifier is reflected and amplified, switching means (28) for switching the impedance of the amplifier into a reflective state and means (39) for binary phase switching the reflected and amplified signal.

- 2.1 The essential difference between the subject-matter of claim 1 and D1 is, that in the claim the amplifier is switched between two reflecting states and that the impedances of the two reflective states are selected to achieve the phase modulation, whereas in document D1 an additional binary phase modulator is used.

Therefore, the subject-matter of claim 1 is new (Article 33(2) PCT).

- 2.3 The problem solved by these new features can therefore be considered as how to reduce the number of components.
- 2.4 Although documents D2 and D3 disclose modulators, in which a reflected signal is phase modulated by switching the impedance in reflective states, it is not obvious

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB00/02200

to combine this feature with the teachings of D1, because these documents are not related to an amplifier. Therefore, the application meets the requirements of Article 33(3) PCT with respect to inventive step.

- 2.5 Claims 2-10 are dependent on claim 1 and, therefore, also meet the requirements of the PCT with respect to novelty and inventive step.

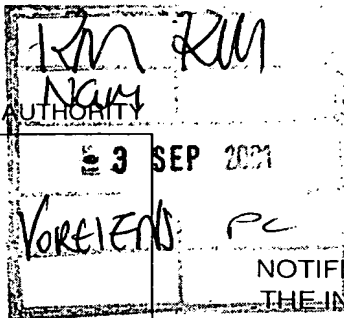
**Re Item VII**

Certain defects in the international application

To meet the requirements of Rule 5.1(a)(ii) PCT, documents D1, D2 and D3 should have been identified in the description and the relevant background art disclosed therein should have been briefly discussed.

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY



## PCT

To:

TOLFREE, Roger, Keith  
MARCONI INTELLECTUAL PROPERTY  
Waterhouse Lane  
Chelmsford, Essex CM1 2QX  
GRANDE BRETAGNE

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT  
(PCT Rule 71.1)

Date of mailing  
(day/month/year) 31.08.2001

Applicant's or agent's file reference

P/61715/MRCE - *Eub...*

**IMPORTANT NOTIFICATION**

International application No.  
PCT/GB00/02200

International filing date (day/month/year)  
07/06/2000

Priority date (day/month/year)  
25/06/1999

Applicant

MARCONI CASWELL LIMITED

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.


#### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office - Gitschiner Str. 103  
D-10958 Berlin  
Tel. +49 30 25901 - 0  
Fax: +49 30 25901 - 840

Authorized officer

Fisher, N

Tel. +49 30 25901-731



# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>P/61715/MRCE</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/GB00/02200</b>	International filing date (day/month/year) <b>07/06/2000</b>	Priority date (day/month/year) <b>25/06/1999</b>
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Applicant <b>MARCONI CASWELL LIMITED</b>		

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Date of submission of the demand <b>16/01/2001</b>	Date of completion of this report <b>31.08.2001</b>
Name and mailing address of the international preliminary examining authority:  European Patent Office - Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840	Authorized officer <b>Masche, C</b> Telephone No. +49 30 25901 471 



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02200

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**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB00/02200

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Industrial applicability (IA)	Yes: Claims 1-10
	No: Claims

2. Citations and explanations  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB00/02200

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